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# **CBRN PAPR**

## **Human Factor Requirements**

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**NIOSH/NPPTL Public Meeting**  
**Hilton Garden Inn, Canonsburg, Pa**

# CBRN PAPR

## Human Factor Requirements

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- Field of View (FOV)
- Fogging
- Communications
- Haze, Luminous Transmittance and Abrasion Resistance

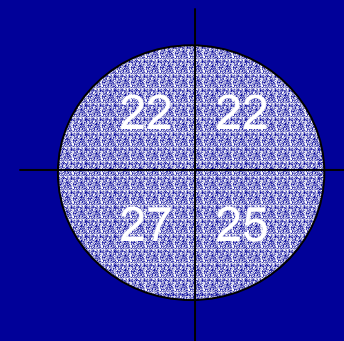
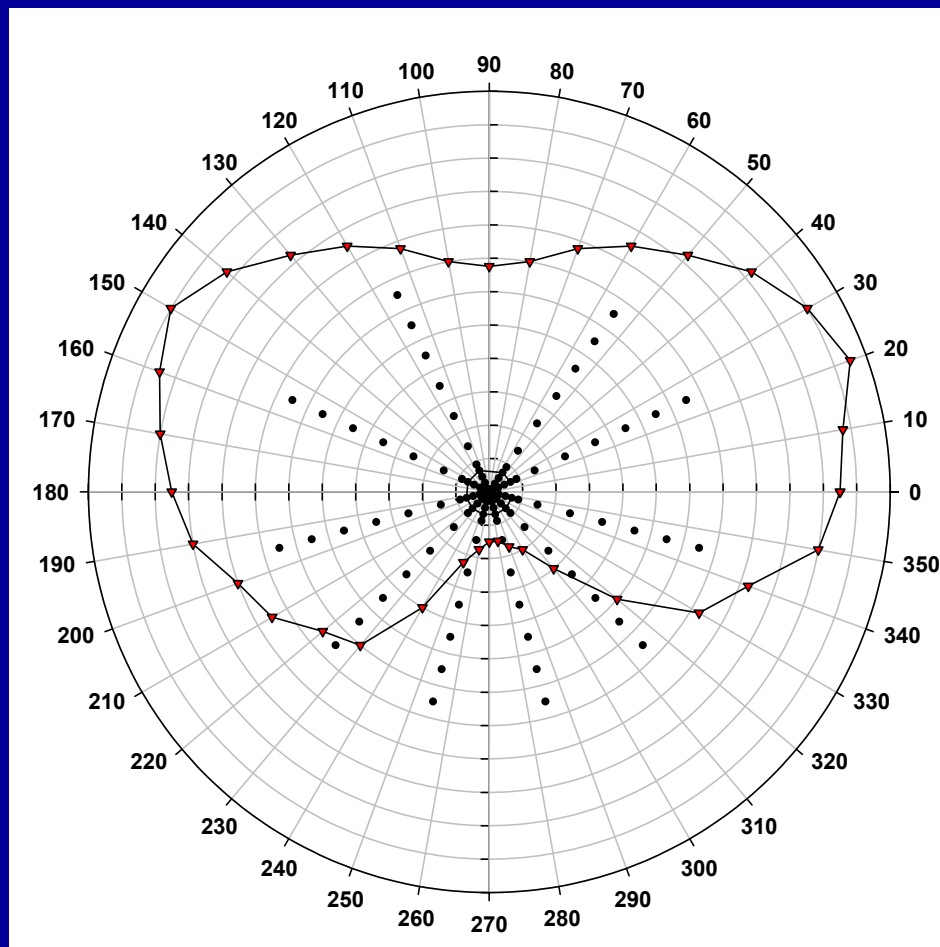
# Field of View (FOV)

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## Requirement:

- Visual Field Score (VFS)  $\geq 90$
- 1 Respirator that anatomically best fits the Head Form of the Apertometer of EN 136: 1998 or equivalent; VFS = Average Score of 3 Fittings
- Derived From: *AMA Guides*; Functional Impact of VFS  $\geq 90$  Translates to Normal Vision

# Example: Respirator FOV Reading



**VFS = 96**

# Fogging Resistance Requirement

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- Requirement: Each Subject's Average VAS  $\geq 75$  points.
- Number of Tests: 2 Human Test Subjects
- Three (3) Visual Acuity Scores (VAS) will be Taken:
  - (1) Post Chamber Don; (2) After 5 min. of Exercise; (3) After another 5 min. of Exercise

# Fogging Test Conditions and Equipment

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- **Environmental Test Condition:**
  - Low Temp Chamber -21.0°C (-6.0°F)
  - 2 PAPRs of each Size Cold Soaked for 4 Hours prior to test
- **Two (2) Human Test Subjects Required w/ Vision  $\geq$  20/40**
- **Test Equipment:**
  - Environmental Chamber
  - Treadmill
  - Snellen Logarithmic Low Acuity Chart 2000 @ 40cm with 2.5% Contrast

# Communication Requirement (Speech Intelligibility)

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- Requirement:
  - Overall Performance Rating (PR)  $\geq 70\%$
- PAPR Motor Blower shall be operating

# Communication Methodology

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- Modified Rhyme Test (MRT)
- Background Noise = 60 dBA  $\pm$  2 dBA consisting of a broadband “pink” noise
- Distance = 10' (3.1m)
- 10 MRT Trials, Yielding:
  - 15 MRT Scores with Respirator and 15 without Respirator; (3 Listeners, and 5 Speakers; 1 Female required in each group )



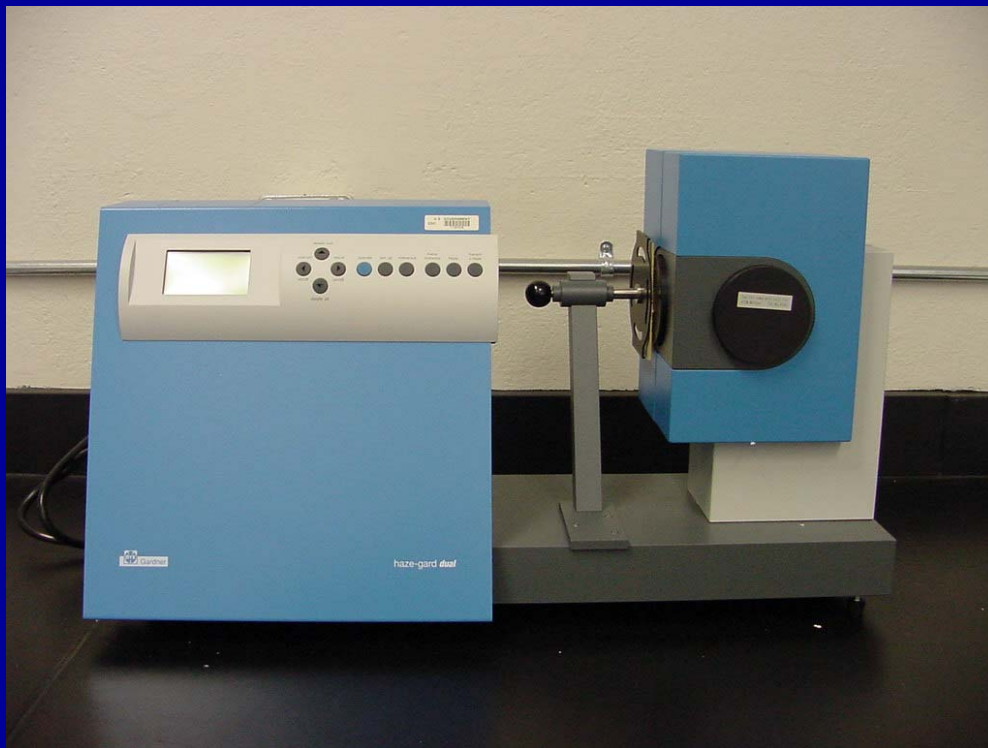
# Primary Lens: Haze, Luminous Transmittance and Abrasion Resistance

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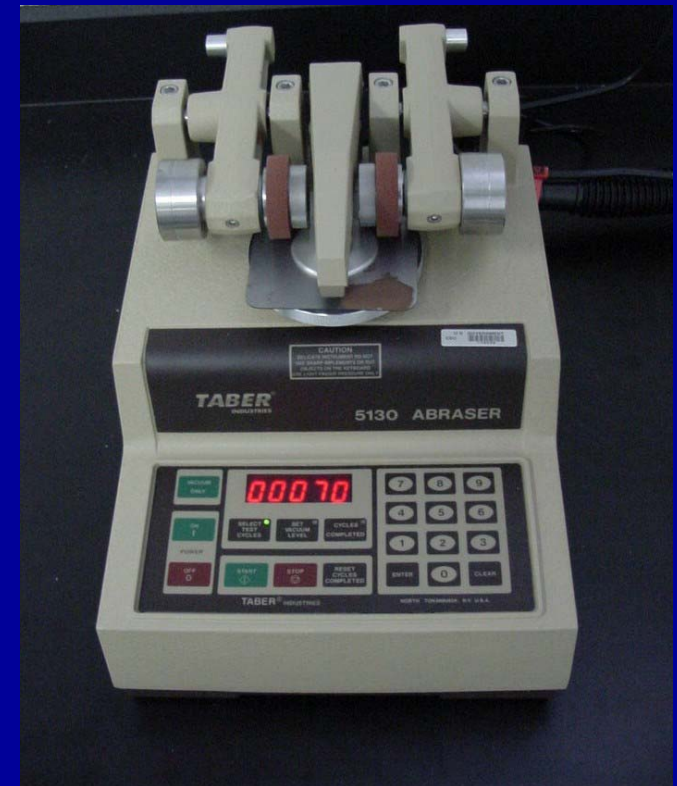
- Requirement:
  - Initial Haze Requirement:  $\leq 3.0\%$
  - Initial Luminous Transmittance (LT)  $\geq 88.0\%$
  - Abrasion Resistance:
    - Haze Not to Increase  $> 4.0\%$
    - LT Not to Decrease  $> 4.0\%$

# Test Equipment

Haze-Gard Hazemeter,  
BYK-Gardner, Model HB-4727  
or Equivalent; ASTM D 1003-00



Taber Abrasive Machine  
or Equivalent;  
ASTM D 1044-99



# Methodology

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- **Specimens Required of Lens Material:**
  - Three (3) flat 4 in<sup>2</sup> (102 mm<sup>2</sup>) Abraded
  - Three (3) flat 4 in<sup>2</sup> (102 mm<sup>2</sup>) Un-Abraded
  - Same protective coating process as production
  - Same nominal thickness as dominant viewing area
  - After Abrasion, Cleaned IAW ASTM D 1044 or PAPR Manufacturer's User Instructions.
- **Test Methods Used:**
  - ASTM D 1003-00: Haze and LT
  - ASTM D 1044-99: Surface Abrasion
    - Abrasion Wheel: CS-10F (Taber)
    - Load: Under a 500 gram weight
    - 70 Cycles (Revolutions)

# Human Factor Requirements Issues, Testing & Timelines

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- **Issues:** None Perceived
- **Testing:**
  - Bench Mark Testing: 3 to 4 PAPRs / \*Mfgr
  - Verification Test (VT): PAPR use same STP(s) as APR so Bench Marking will suffice for VT
- **Timelines:**
  - Complete VT by Sept 2004
- \* **Minimum of 3 Manufacturers**

# Summary / Conclusion

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- Field of View (FOV) Requirement:  $VFS \geq 90$  Points
- Fogging Requirement: Each Subject's Avg VAS  $\geq 75$  Points
- Communications Requirement:  $PR(\%) \geq 70\%$
- Haze, Luminous Transmittance and Abrasion Resistance
  - Haze Requirement:  $\leq 3.0\%$
  - Luminous Transmittance (LT) Requirement:  $\geq 88.0\%$
  - Abrasion Resistance Requirement:
    - Haze not to Increase  $> 4.0\%$
    - LT not to Decrease  $> 4.0\%$
- ❖ Human Factor Requirements and Standard Test Procedures Same as NIOSH CBRN Full Facepiece Gas Mask